After the reading is taken this hook is lifted, the thermometer taken off from the support and held firmly in hand with the bulb end down, and given one or more sharp rapid downward swings over the evaporation pan, so that any water thrown off goes back into the pan. The same device has been used for the purpose of taking water surface temperatures in lakes and ponds.

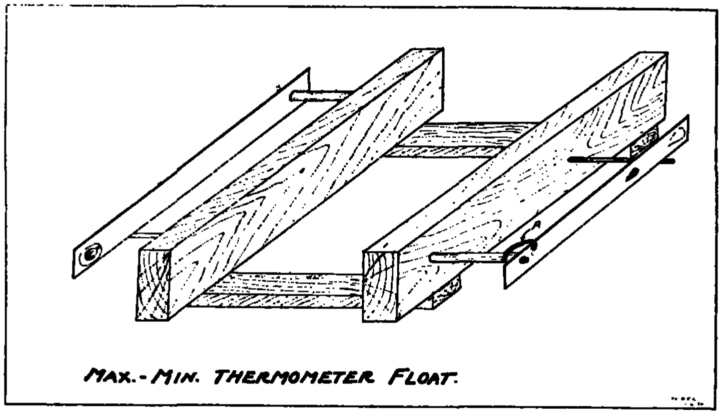

FIG. 1.—Wooden float for obtaining maximum and minimum water-surface temperatures.

In view of the fact that there are so many evaporation records now being kept where records of water surface temperatures, really the most important factor, are omitted, and in further view of the importance of water surface temperature records in lakes and ponds, this note may be of value. Such records are very scarce.

FORM AND AREA FACTORS FOR EVAPORATION.

By W. GALLENKAMP.

(Abstract from Meteorologische Zeitschrift, January-February, 1919, 36:16-22.)

Using small circular atmometer surfaces from 2 to 8 centimeters in diameter, the relative masses of water lost from different sized atmometers were determined. In the first two series of experiments, four atmometers of different sizes were rotated on a frame having arms of 28 centimeters radius. In three subsequent series, atmometers of different diameters were exposed without rotation in the free air. In the sixth series, atmometers of 2.4 and 7.5 centimeters diameter, respectively, were rotated on a frame, one of each size being placed at 14 and one at 28 centimeters radius.

As a result of these experiments the author concludes that—

(1) The mass of evaporation from different sized atmometers subject to wind action increases according to a form of parabolic law with the diameter of the atmometer.

(2) The relative depth of evaporation from atmometers of different sizes subject to wind action varies inversely as about the 0.4 power of the diameters.

(3) The reduction in evaporation depth with increased diameter is practically independent of the wind velocity.

The author concludes that the reduction in evaporation depth with increased area of surface in the wind is due to the carrying forward of vapor from the windward to the leeward side of the atmometer. As a check on this conclusion and on the formula, an experiment was carried out using two atmometers, each 1.5 by 7 centimeters. One of these was placed with its longer axes perpendicular to the wind direction, and the other with its longer axis parallel with the wind. For similar exposures, these two atmometers should give equal depths of evaporation in perfectly still air. When exposed in the wind, the relative depths of evaporation were as 1.80 to 1, the atmometer with its longer axis parallel with the wind giving the smaller result. The author's inverse 0.4 power rule gives a ratio 1.85 to 1 for this case.

The subjoined table shows the relative masses of evaporation (not depths) from atmometers of different sizes, and the corresponding evaporation ratios computed by the author's formula—

$$\frac{V_1}{V_2}=\frac{B_1}{B_2}\sqrt{\frac{L_1^{1.2}}{L_2^{1.2}}}$$

in which v_1 and v_2 are the volumes of loss by evaporation in the atmometers having lengths L_1 and L_2 parallel with the wind, and widths normal to the direction B_1 and B_2. Reduced to the terms of relative depths of evaporation, this formula becomes—

$$\frac{E_1}{E_2}=\frac{d_2^{0.4}}{d_1^{0.4}}$$

for circular atmometers, in which d_1 and d_2 are the diameters of the atmometers.

The author points out that his formula is not based on sufficient experimental data, nor do the experiments cover a sufficient range of diameters so that it can be safely applied beyond the limits of the experiments. The formula would indicate zero evaporation depth from an indefinitely large area exposed to the wind, whereas experiments show that the evaporation depth from very large areas approaches as a minimum a limit not far from one-half the depth lost from an evaporation pan of the ordinary sizes used in the field experiments. It appears probable therefore that the law governing the area factor is exponential rather than parabolic.[1]

The author gives results of experiments on the evaporation loss from atmometers exposed to wind action, using distilled water containing various percentages of salt. The mean reduction in evaporation rate in percentage of that for distilled water for different solutions was as follows:

Per cent salt	1.5	3.0	4.5	6.0
Per cent reduction	8.3	12.0	15.2	18.1

—*R. E. H.*

DISCUSSION.

The experimental work referred to in this paper is not only insufficient, as stated by the author, but perhaps also imperfectly planned. The pans are surprisingly small, and, besides, the turbulence incident to whirling is quite certain to introduce serious irregularities in the rate of evaporation. Nevertheless, the conclusion that the quantity of evaporation is proportional to the 1.6 power of the diameter (for circular vessels) is surprisingly near the theoretical value, 1.5, deduced by Jeffries. (Phil. Mag., 35, p. 273, 1918.)—*W. J. H.*

[1] An exponential formula for area factor which gives results consistent with experience for large areas, derived theoretically from the assumption of stream-line transport of vapor from windward to leeward over an evaporation surface, is given in Engineering News Record, Apr. 27, 1917, pp. 196-199.—*R. E. H.*